

II. LEYDEN : DISEASES OF SPINAL CORD.

KLINIK DER RUECKENSMARKS-KRANKHEITEN. Von Dr. E. Leyden. Zweiter Band. Erste Abtheilung. Mit 6 Zum Theil farbigen Tafeln. Berlin, 1875. S. 300. (*Clinic on diseases of the Spinal Cord &c.*)

Continued from the last number.

Spinal irritation is ascribed, apparently, to "abnormal conditions of bloodfulness" of the cord, or at least, is discussed under this title. But we see no propriety in ranging it under this head, but the contrary. Spinal irritation does not principally depend, in our judgment, on a disturbance of the circulation in the cord. But we have no time nor space at present in which to discuss this subject. We have already done so to considerable extent, especially in a lecture to be published in the *American Clinical Series*, edited by Dr. E. C. Seguin, of New York. We would refer such of our readers as may feel an interest in the discussion to that lecture.

Under the head of "hysterical spinal irritation," we find placed the "hysterical contractures," that have been so thoroughly discussed by Charcot. But Dr. Leyden denies that the cases of permanent "contracture," in which there is found after death, sclerosis of the lateral columns of the cord, are "hysterical." The presence of a demonstrable nervous lesion, removes them from this category, so Dr. Leyden thinks. He would account such as complicated cases. "Hysterical paralysis," (usually hemiplegic) it is truly said, is generally accompanied by cutaneous and muscular anesthesia in which it differs in most cases from the more ordinary forms of paralysis. The fact that the cutaneous and muscular sensibilities are so often involved on the same side as that of the motor paralysis, testifies to the high position of the disorder or lesion, as does also, the ease with which such affections are modified by mental and emotional influences. Their real central seat, so far as the nervous system is concerned, is within the cranial cavity, above the point of decussation of the motor tracts. But if this is so, how shall we include such forms of disorder, whether spasmodic or paralytic under the head, "*Spinal* irritation?" Under this same title, Dr. Leyden ranges "hysterical ataxia," and "hysterical chorea." But in our opinion the former is more frequently cranial than spinal, while the other is probably always cranial.

Next are some valuable remarks on the diagnosis of spinal hysterical affections, and their treatment. But we must refer the reader to the work itself, for the discussion of these topics.

What we object to, is that Dr. Leyden should range the above described hysterical, and other affections, as *spinal*, and that

they should be referred to "abnormal conditions of bloodfulness" of the cord, in the almost complete absence of proof of the correctness of such a view.

As to the account of the "abdominal" or "hemorrhoidal," form of "spinal irritation," it is very practical, and according to our opinion correct. Irritable and often tender spots on the spine appear, in connection with disease of the alimentary canal especially if it is of an irritative character and of chronic course. Those sections of the cord, back to which the nerves from the affected part may be supposed to go, under the influence of a steady irritative discharge from the seat of disease, become worn, painful,—irritable. The corresponding section of the spine becomes, or may become tender to pressure, and may even exhibit spontaneous pain. This is "spinal irritation," and this according to our opinion is in brief, its mode of production. But such does not appear to be the view of Dr. Leyden. He offers no remarks indeed, on this subject. But it is an important one from every point of view.

The next section is devoted to "spinal irritation," produced by exhausting influences, particularly by "seminal loss." But we do not see on what good grounds, a fundamental distinction is to be made as between this, and the so-called "abdominal form," except the superficial one of causation. Dr. Leyden's notion of the distinction between these two forms of "spinal irritation," is more radical than this, and is hence according to our opinion untenable. The irritative state in which the genital system is, in at least most cases of spermatorrhea, affects the corresponding section of the spinal cord, in the same manner as irritative disease of the womb, or of the alimentary canal. There is no radical distinction between such cases, except, that the seats and forms of irritation are different. Dr. Leyden in this, as in so many other parts of his work, has unconsciously failed to carry his analysis of morbid phenomena to a respectable degree. His distinctions have generally a clinical, rather than scientific value.

Dr. Leyden very much doubts the possibility of determining the existence of spinal anæmia during life, or indeed after death. He appears to admit, however, the existence of anæmic paralysis, and describes two of its recognized forms, viz.: "anæmic or chlorotic paralysis," and "paralysis from hemorrhage."

Under the title of "ischæmic paralysis," a number of interesting cases both experimental and accidental, are given. The most important and practical remarks, under this head relate to ischæmia as produced by embolism or by disease of the vessels of the cord. Beginning with the experimental studies of Panum on embolism, as produced by the injection of fine pellets of wax into the abdominal aorta, so as to plug the small vessels which it gives off, and among them those of the cord, and those of Vulpian who used lycopodium powder instead of wax and with

similar results, viz.: with the speedy production of complete paralysis, both of sensibility and motion, he passes on to clinical observations. That some such condition may occur in the human subject, accidentally, there can be no doubt. Cases in point are cited from Cohn (*Klinik der embolischen gefaesse Krankheiten*) and Tuckwell (*Brit. and For. Med. Chirurg. Rev.*, Oct., 1867.) The emboli, it is conjectured, may come from the valves or endocardium of the heart.

This leads to a discussion of the observations first made by Kirkes in England, and Roger in France, in regard to the relations between chorea, and rheumatism. It is held, that the real relation between these diseases, depends on the formation of small exudations on the valves of the heart, and that these being washed off are carried into the small vessels of certain parts of the nervous system, so as to constitute true capillary embolisms, and so produce the disease. But that this cannot be the essential pathological condition in all cases, will appear when it is remembered, that chorea does not always occur in connexion with rheumatism, and that the disease often comes on and goes off, in such way, as to make it difficult to attribute it to embolism, and finally for the reason, that other organs and parts ought to suffer from embolism, as well as the upper portion of the motor apparatus. But other parts of the nervous system do not, nor do other organs, in due proportions. It is wholly improbable that emboli, borne along in the general tide of the circulation, could select special places for lodgment. Chorea, must be explained in some other way. It cannot be truly called a spinal disease, and in so far as it is not, its discussion, is out of place in this volume.

Thromboses of the vessels of the cord are quite fully considered. They generally arise on account of disease of the walls of the vessels.

They have not been carefully studied, in the cord, though they have been in respect to the brain. They are more likely to occur in the aged, and a very full and interesting account is given of nervous vascular disease in the aged.

The structural changes which the vessels themselves undergo, and the atrophy of the ganglion cells of the gray matter of the anterior horns, and the degenerative atrophy of the white columns of the cord, more particularly the lateral, and those of Goll, are fully described, as generally underlying the disorders of motility, witnessed in old age.

The general symptoms of senile disease (?) of the cord, are very carefully stated and discussed. The *tremor senilis*, he considers cannot as yet, be connected with any definite morbid condition, though Dr. Leyden says he has often found in the cord, medulla and pons, in such cases, "decided pigmentation of the ganglion cells, and profuse deposits of corpora amylacea."

The muscular weakness and atrophy in such cases are referred back to degenerative disease of the multipolar cells of the anterior horns of gray matter of the cord.

Senile spinal softening is believed by Dr. Leyden to be one of the ultimate terminations of obstruction or disease of the spinal vessels.

In this notice we feel obliged to pass by the important chapter on "Hemorrhages into the substance of the Spinal Cord." We would not do so, however, without pointing it out to the reader as one of the fullest and most practical, with which we are acquainted.

The chapter next in order is entitled "Traumatic Affections of the Spinal Cord." Under this head we have, 1. "Compression and crushing of the spinal cord by means of fractures, luxations, etc." 2. "Laceration or rupture of the spinal cord, by means of blood-clots, shots, fractures, stabs, cuts, and concussions of the spinal cord."

At present we will omit reference to all but concussions of the cord and their consequences. These have a special significance, from the frequency with which they come to notice, as a form of railway injury.

The pathological anatomy changes which have been observed in cases of "concussion" are valuable, as aiding to fix upon definite anatomical seats of injury, especially in medico-legal cases. The material on this point is much more full and valuable, in this work of Dr. Leyden than in that of Mr. Erichsen, to be reviewed in the next number.

In all cases in which severe symptoms have followed concussion of the cord, though no demonstrable lesion may have been found after death, yet we are justified in assuming such a material change in the molecular structure of the cord, as to account for the symptoms. But there can be but little doubt in our own minds, but that a diligent search throughout the cord, by competent observers, would result in the discovery of undoubted material lesions, sufficient to partly at least, account for the symptoms in nearly all cases.

In many, however, Dr. Leyden describes small lacerations, hemorrhages, especially capillary. Cases are cited from Waters, Bennett, Kirkbride, and from his own practice.

The prognosis is not good, according to Dr. Leyden. Such cases are very prone, where they have endured for a time, without improvement, to assume an irritative character, leading to difficult, and sometimes dangerous forms, of myelitis, with its multiform bad consequences. Tetanus sometimes follows concussion of the spine. Also, meningeal inflammations. Says Dr. Leyden, "the indirect consequences of concussion of the spine are of peculiar interest and of prominent practical importance, and such, indeed, as are not included in the original wound." These consequences are generally developed slowly, and may be enumerated as chronic meningitis, myelitis, myelomeningitis, neuralgic pains, paresis, paralysis, atrophies, chronic degenerations of the cord, etc. Dr. Leyden agrees with Erichsen very properly in the statement that concussions arising

from railway injuries present no peculiar symptoms, as compared with cases produced in other ways. They are only peculiar, by reason of being made the basis of actions at law for damages against railway companies.

In an appendix, Dr. Leyden introduces certain statements, in respect to concussion of the medulla oblongata. Special reference is made under this head, to the experiments of Westphal (Berliner Klin. Woch. No. 38, 1871) on Guinea pigs, which consisted in producing concussion of the head and neck, with various degrees of violence, and then observing the effects *post mortem*. He found small hemorrhages in the pons, medulla, and the upper portion of the cervical spinal cord. The same symptoms are sometimes produced by blows in man, in the same region, and it is presumed they are due to similar lesions.

Various important symptoms and morbid states arise, which are consequences, and hence, indications, of injury to the medulla, and pons and related portions of the cord.

Prominent among these, are epilepsy, and more or less permanent, slowing of the heart's action, sinking sometimes so low as 20 or 30 beats in a minute. This state gives way in some cases, to great, even dangerous, frequency of the pulse. No attempt whatever, is made to explain such phenomena. Diabetes is another morbid condition growing often out of injury to the parts in question, as might have been expected, in view of the known effects of wounds in the floor of the fourth ventricle, on the action of the kidneys.

Dr. Leyden cites numerous cases of diabetes produced by injuries to the medulla, or in its region.

As might have been expected, also, disorders of speech and of hearing, are not uncommon in lesions of medulla, depending of course on the seat of the lesion.

This chapter is closed by a lengthy section on "shok," (shock). He admits the distinction, between shock, and concussion of the spine, which has been made by several English writers.

Traumatic shock, which is so well known, since its first clear description by Guthrie, (*on Gunshot Wounds*,) and with the phenomena of which English and American surgeons have long been familiar, is compared to the condition produced in frogs by Goltz, in his well known "rapping experiment" (Klopfer-such. In his experiment, which consisted in giving a sharp rap, on the abdomen of the animal, he observed imperfect, and greatly diminished action of the heart, a feeble, slow circulation, general weakness, trembling, etc. The phenomena were the same in fact, as are collectively entitled shock, in man.

Goltz held the cause of the phenomena, to be a sudden loss of vascular tonus, by means of which, dilatation of the muscular vessels occurs, especially those of the intra-abdominal circulation. By reason of the general loss of tonus, resistance to the heart is diminished, and hence its action is more feeble, and by reason of the withdrawal from the general circulation, of

such a mass of blood as is retained in the vascular region supplied by the splachnic nerves, the pulse is weakened, as seems to be the fact.

Fischer, explained the phenomena in much the same way as Goltz, while the author is rather inclined to attribute them, to inhibitory nervous action, but in what we are wholly unable to see.

A detailed account of the phenomena of shock next follows, but it contains nothing worthy of special mention. Dr. Leyden agrees with most other observers, that the prognosis of the diseased state is not happy.

In the next place Dr. Leyden describes "psychical shock," such as is produced by sudden and powerful emotion of any kind, but especially by that of a depressing character, as fear, disappointment and also that produced by "lightning stroke." But there is nothing sufficiently novel or valuable in his account to justify mention in a notice such as the present.

We pass at once to the next or fourth chapter (pages 115 to 212)—on *acute myelitis*, which is one of the most valuable in the work, and forms one of the most complete and suggestive memoirs on the subject of which its treats, to be found in medical literature. After certain introductory remarks, Dr. L. passes to a tolerably exhaustive account of the pathological appearances gross and microscopical, of the diseased cord. A lengthy and interesting history of the literature of the disease, and of the progress of knowledge respecting it, is given. The name "myelitis," seems to have been first applied by Leonhardi.

The labors of Hildbrandt, Harless, Klohs, Ollivier, Abercrombie, Reinhardt, Frommann, Munk, Brown-Sequard, Lockhart Clarke, Charcot, and his pupils, Dujardin Beaumetz, Damaschino, Westphal, Liouville, and many others, are referred to.

Dr. Leyden now passes to a minute statement, as to the morbid appearances, perceptible after death from myelitis artificially produced in dogs, by the injection into the substance of the cord, of 10 to 20 drops of Fowler's solution of arsenic, by means of a Pravaz syringe. The description is so full and definite that we feel like quoting a few passages from it. Speaking of the appearance of the experimentally produced disease in dogs, he says:

"With the unaided eye, in the fresh preparation, the myelitic process may be followed a considerable distance, both above and below the point of original lesion. But beyond these limits, we are able to discern with the microscope, morbid changes, characteristic of myelitis, but especially granule cells, pus corpuscles, and both altered nerve fibres and cells. But the extension of the morbid process is much better followed, after hardening the spinal cord in chromate of ammonia, previous to making the microscopical investigation. An exquisite and easy means for studying the full extent of the myelitis is thus af-

fording by the hardening and carmine coloring. We thus perceive that the morbid process extends farther than could have been supposed from a microscopic examination of the parts, in a fresh condition. After the process of hardening has been carried on for a week, or longer, light colored islets or spots, variable in size, become apparent, and impart to the cut surface a maculated appearance. We have also, as one of the outcomes of the more chronic myelitic softening, found occasional spots which are unconnected with softening, and are to be considered as evidence of a slighter degree of myelitis. Their arrangement is various. In the majority of cases, they abound most in the posterior half of the cord, sometimes predominating in the posterior columns, insomuch as to present the appearance of an isolated affection of the latter. The posterior columns may be simultaneously or separately affected, and finally we may meet with small myelitic spots in the anterior parts of the cord. In other cases myelitic spots arise very sparingly in the white substance, while to the contrary the gray substance of the cord may be extensively involved. It contains under these circumstances, numerous small hemorrhages, enlargement, and apparent numerical increase of bloodvessels, and fatty or purulent softening—'central softening.'

"But this process may continue in the gray substance around the central canal, (peri-ependymar central myelitis) or the pus enters and flows along the central canal of the cord, and continuing along the same, causes inflammation and softening of remote parts of the cord in and about the canal, (endo-ependymar myelitis), or finally, we see in many cases generally the periphery of the cord attacked, frequently without evidence of or connection with meningitis (periph-ral myelitis—perimyelitis.) "(122.) The softening to which the myelitis leads, in many cases, is divided into three stages, the analogy of which is found in the same process in other organs." They are:

"1. Red or hemorrhagic softening, with hyperaemia. Blood is exuded through the affected tissue, there is swelling, and in parts there is translucent oedema, and even a slightly opaque condition.

"2. Yellow softening, the stage of fatty degeneration, in which the coloring is not regular, the cut surface appears unevenly clouded, mottled or striped—an indication that the part has partly lost its normal structure.

"3. *Gray softening*, the stage of resorption and atrophy, in which the softened spots are sunken in, atrophied, easily lacerated, and of a gray or gray red, translucent color, and in this yellow substance are found strewn, yellow, yellowish white, and grayish white islets and points." (P. 125.) These three stages, which are given in their order in time, include another, not clearly separable from them, viz: the "purulent or green softening," chiefly characterized by the presence of pus. The precise and detailed appearances which belong to these morbid states

are given with much fulness, and evidently are not derived from second hands. We would be glad to enter more fully into a portion of the work, but it will not be possible in this notice.

In man, beside the myelitic spots, such as have been already noticed, Dr. Leyden describes "secondary degenerations," in the white substance, *ascending* in the posterior, and *descending* in the lateral columns.

We will once again translate a portion of the account given, of microscopical appearances, since they are so full and instructive.

"If we investigate a well hardened section of a fresh hemorrhagic softening; (if we use the chromate of ammonia to harden, and a solution of carmine to color it), the whole section appears strongly clouded and reddened by the carmine. The area of the hemorrhage has yet in spots a greenish or yellowish pigmented appearance, and besides, there are numerous large red points, particularly in the gray substance. Under the microscope the blood appears comparatively fresh, in clots of variable size, or it is infiltrated through a portion of the substance of the cord, without apparent laceration of the nervous substance, and in later stages we find considerable accumulations of yellowish green, or brownish pigment, lying in the tissues. * * * * The blood is insinuated between the nerve-fibres, separating them from each other, and by pressure causing their atrophy or absorption in parts, and in others they become enlarged, swollen. * * * * In other places the vessels—(most frequently the veins)—are strongly dilated. The arteries are seldom over full with blood, but frequently they show infiltration of the adventitia, which causes them to present the appearance, in the preparation, of large red points. This infiltration of the adventitia is either a perivascular hemorrhage, or a deposit of granule cells, pigments, etc. Sometimes the vessels are seen to be surrounded by a deep red colored, granular amorphous substance, layers of which are continued onward between the adjacent nerve elements. Such appearances, however, are often found having no apparent connection with the vessels, but deposited in the nervous substance.

"We have to deal in such cases, probably with an actual albuminoid substance, rendered granular by the hardening process. In every case this is the only trace of a free exudation, which I have found, that could be compared to the 'foyer's d'exudation,' of Michaud. In many cases of recent softening, the vascular changes are very slight, neither hemorrhage, nor noticeable dilatation being found, simply cell, and fatty deposits, in the adventitia.

"The nerve substance itself appears quite early to be noticeably altered. The predominant changes consist, in enlargement and aflend conditions of the axis cylinders of the nerve fibres. Occasional fibres become enormously enlarged, containing a correspondingly enlarged axis cylinder. Their myeline sheaths are

colored of a light green tint, and are often granular and imbibe, and are hence colored by, the carmine.

"Many fibres at this time appear destitute of myeline, the latter being replaced by a reddish substance which is tinged with carmine, and undistinguishable from the axis cylinder.

"As in the fresh preparation, so in the one subjected to the action of re-agents, we may convince ourselves by longitudinal sections, that the liquefaction and discharge of the axis cylinder substance, does not involve any considerable length of the fibre, but gives place at irregular intervals to varicose swellings, the substance of which becomes either a vitreous fluid, or is studded with fat granules, and contains vesicular spaces, *vacuoles*. In the neighborhood of such changes, we frequently find nerve fibres, atrophied, or compressed, but in other respects, unchanged.

"The changes experienced by the ganglion cells, and which are the most pronounced in the multipolar cells, of the anterior horns of gray matter, are very similar to those just described in respect to the axis cylinder of the nerve fibre.

"In the fresh specimen we find the cells enlarged, and with fluid contents, the nucleus being often enlarged. Many clearly exhibit fatty degeneration, being almost opaque with fat. Beyond this the fresh cells show vacuoles. * * * * Sometimes the nucleus alone manifests change. It is compact, flattened, or oval, homogeneous, and loses its nucleoli, or it is enlarged, and contains two nuclei, and sometimes the commencement of a process of a subdivision of the nucleus can be seen. * * * * Finally we meet with destruction of the cell, it becomes fissured, and constricted, at least in the hardened preparation, it is shiny and small, so that it appears to have undergone atrophy.

"The changes which the neuroglia undergoes have a quite peculiar interest. The best known and most remarkable finding, which is not peculiar to any stage of myelitis, not even to acute, is the occurrence of fat granules, cells, and masses. They appear in the fresh preparation, as dark, round, or oval masses, composed of drops of various sizes, sometimes provided with a nucleus, more rarely a mass of myeline. In quite recent myelitis, they occur, but not to the same extent as in later stages of the yellow softening, in which they are developed with great profuseness. The majority of authors, derive the granular bodies from the elements of the neuroglia, but Mankoff to the contrary from the nerve fibres. But both views may be correct. It is quite conceivable, that fragments of nerve fibres which have been destroyed through fatty degeneration, may contribute to these granular bodies. * * *

"But after all it appears to me not to be doubted, that the chief mass of the granule cells arise from the neuroglia. Because; i. they are often seen to lie abundantly in and beside the sheaths of vessels where no nerve substance is present, * * * and ii. we perceive very clearly as a rule, that they lie between the

nerve fibres, pressing them asunder, and sometimes we find two or more of these bodies included in one of the above mentioned "vesicular spaces," and finally we may as I believe, find preparations which directly prove their origin from the nuclei of the neuroglia. It cannot be doubted that a very considerable increase of its elements occurs by means of division or fission, is may be concluded, from their very great number, and their mode of grouping, and the frequency of occurrence of two nuclei where there is ordinarily only one.

"They abound especially in proximity to the bloodvessels, and we are inclined to regard them as "wandering cells," from the bloodvessels. But this relation is not a constant one."

"In the earlier stages of myelitis, usually they lie strewn separately or in groups, in the nervous tissue, before the vessels are covered with them. They must therefore have proceeded from the stationary cell elements of the neuroglia, which suffer accordingly, enlargement, numerical increase, and fatty metamorphosis." (P. 131.) This is a partial description of the microscopical changes which are characteristic of the first stages of myelitis. An equally full and definite account of those characteristic of the later stages of "yellow," and "gray," and of the less regular form of "green" softening is given, but we cannot transcribe it in this place.

We have given so many of these minute details, because they are so seldom presented and because they have great scientific and practical interest. They represent the kind of *post-mortem* work that must henceforth be done, if such work is to have any definite value. The time has come when a mere superficial microscopical description of the appearances after death, in such cases, has no real value. It is only recently, that this higher and more valuable style of work is being done. And we can point to no better example of it, than is contained in the rich article on the *post mortem* appearances in myelitis in this invaluable work of Dr. Leyden.

But we must postpone any farther notice of the present work, until the appearance of the final portion of this volume which may be shortly expected, or at least, until another number of the JOURNAL.
